

## UPPER ENTERPRISE RESERVOIR



### Introduction

Upper Enterprise Reservoir is in the Bull Valley Mountains in extreme southwestern Utah. It is a large impoundment of a stream valley. Lower Enterprise Reservoir is immediately downstream and is a moderate-sized body of water (79 acres) in its own right. Some maps and agencies refer to the larger reservoir as only Enterprise Reservoir.

The reservoir shoreline is owned by the Dixie National Forest with unrestricted public access. The dam, an earth-fill, was built in 1912. Water is used primarily for irrigation, however, DWR does own a conservation pool of 200 acre-feet for maintenance of a fishery. Defined beneficial uses include: water recreation excluding swimming, propagation of cold water species of game fish and aquatic life, and agricultural needs.

### Recreation

#### Characteristics and Morphometry

Lake elevation (meters / feet)	1,755 / 5,761
Surface area (hectares / acres)	107 / 265
Watershed area (hectares / acres)	7,537 / 18,700
Volume (m <sup>3</sup> / acre-feet)	
capacity	12,088,318 / 9,800
conservation pool	246,700 / 200
Annual inflow (m <sup>3</sup> / acre-feet)	
Retention time (years)	
Drawdown (m <sup>3</sup> / acre-feet)	
Depth (meters / feet)	
maximum	18.2 / 60
mean	14.0 / 49
Length (km / miles)	1.92 / 1.18
Width (km / miles)	1.68 / 1.03
Shoreline (km / miles)	11.27 / 7

#### Location

County	Washington
Longitude / Latitude	113 52 20 / 37 31 05
USGS label, UT 1972, Water Canyon Peak, UT, 1972	
Cataloging Unit Southern Escalante Desert (16030006)	

Upper Enterprise Reservoir is on a paved secondary road west of the town of Enterprise. Travel west out of town for six miles to a place called Hebron. At Hebron,

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(left) on another paved road and continue for five miles to the Honeycomb Rocks Campground, from which both reservoirs are accessible.

Fishing, boating, picnicking, camping, and hiking are popular around the lake. The road is well maintained year round. Usage is heavy.

Honeycomb Rocks Campground is on a peninsula bordered by the lower reservoir to the east and the upper reservoir to the west. It has flush toilets, 21 campsites, drinking water, a boat ramp, and fishing areas. Usage fees are charged. This is one of the most distinctive campgrounds in the State. It is nestled in an area of unique rock formations that provide a nonstop recreational resource for children. There are no private campgrounds in the area.



### Watershed Description

Upper Enterprise Reservoir is located in the lower slopes of the Bull Valley Mountains. Rock Creek, a tributary, has recently pirated drainage in the Water Hole Peak area, indicating that the drainage basin is adapting to recurring tectonic activity.

The watershed high point, Lost Peak, is 2,291 m (7,516 ft) above sea level, thereby developing a complex slope of 10.3% to the reservoir. The inflows are Rock Creek, Pine Creek, Rattlesnake Creek, and Lost Creek. The outflow is Little Pine Creek.

The soil is of limestone origin with rapid permeability and erosion. A complete listing of the soil compositions in the watershed are listed in Appendix III.

The vegetation communities are comprised of pinyon-juniper, sage-grass, and bitterroot-mahogany. The watershed receives 30 - 41 cm (12 - 16 inches) of precipitation annually with a frost-free season of 120 - 140 days at the reservoir.

Land use is multiple use and recreation, the major use being livestock grazing. Much of the watershed is overgrazed, resulting in heavy runoff and substantial soil

erosion.

### Limnological Assessment

The water quality of Upper Enterprise Reservoir is fairly good. It is considered to be soft with a hardness concentration value of approximately 74 mg/L (CaCO<sub>3</sub>). Those parameters that have exceeded State water quality standards for defined beneficial uses are total phosphorus, dissolved oxygen, temperature and pH. The average concentration of total phosphorus in the water column for the three study periods was 36, 221 and 37 ug/L which all exceed the recommended pollution indicator for phosphorus of 25 ug/L. The phosphorus concentration in the hypolimnion in August, 1989 average 336 ug/L. This increased concentration occurred when the reservoir was shallow and it appears that resuspension of bottom sediments rich in nutrients were resuspended in the water column. This was also the period when biological productivity was very high which resulted in elevated pH values in excess of 9.0 and water temperatures higher

#### Limnological Data

Data averaged from STORET sites: 494072, 494073

<b>Surface Data</b>	<b>1979</b>	<b>1989</b>	<b>1991</b>
Trophic Status	E	H	E
Chlorophyll TSI	-	76.60	58.51
Secchi Depth TSI	48.64	60.00	58.97
Phosphorous TSI	51.51	84.33	57.61
Average TSI	50.6	73.64	58.36
Chlorophyll <i>a</i> (ug/L)	-	96.75	17.25
Transparency (m)	2.2	0.9	1.1
Total Phosphorous (ug/L)	20	214	41
pH	8.4	9.4	8.6
Total Susp. Solids (mg/L)	<5	-	10
Total Volatile Solids (mg/L)	-	-	9
Total Residual Solids (mg/L)	-	-	16
Temperature (°C / °f)	19/66	18/65	17/63
Conductivity (umhos.cm)	145	225	188

#### Water Column Data

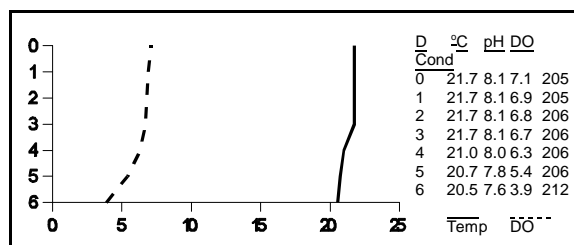
Ammonia (mg/L)	0.05	0.08	0.05
Nitrate/Nitrite (mg/L)	0.14	-	0.02
Hardness (mg/L)	62	-	85
Alkalinity (mg/L)	68	-	88
Silica (mg/L)	20	-	3.7
Total Phosphorous	36	221	37

#### Miscellaneous Data

Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	0.5	7.9	5.9
Stratification (m)	10-13	NO	N
Depth at Deepest Site (m)	17	4.0	6.0

\*Spring data limited to surface readings

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than the recommended level of 20°C. The reservoir was characterized as a hypereutrophic system with an average chlorophyll-a concentration of 96.75 ug/L. It is apparent that the during low water conditions, the reservoir is impacted as algal production reaches extreme conditions. Although dissolved oxygen concentrations are not consistently low throughout the water column, investigations should be conducted during winter to observe conditions at that time.

Data suggest that the reservoir is currently a nitrogen limited system. TSI values indicate the reservoir is typically eutrophic, but can become hypereutrophic as conditions permit. These types of conditions are probably more frequent due to the high demand for irrigation water downstream and the potential for low precipitation in the area on an annual basis. The reservoir has not stratified during recent summers due to low volumes, but when sufficient depths are present the reservoir does stratify as observed during the initial study period (1979).

According to DWR no fish kills have been reported in recent years, but the recognize the problems associated with high pH and low water levels during the summer. Elevated water temperatures and high algal blooms which deplete dissolved oxygen concentrations during night time hours can result in fish mortalities. The reservoir is managed primarily as a rainbow trout (*Oncorhynchus mykiss*) fishery. The lake has been treated for rough fish competition in 1956, 1976 and 1987, so populations of native fishes may not be present in the lake, but the presence of non-game species appears to be a continual problem. Current stocking reports indicate that DWR stocks the reservoir with approximately 30,000 fingerling rainbow trout annually.

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm <sup>3</sup> /liter)	% Density By Volume
<i>Gloeotrichia echinulata</i>	55.600	74.52
<i>Aphanizomenon flos-aquae</i>	18.55	13.839
<i>Sphaerocystis schroeteri</i>	2.641	3.54
<i>Stephanodiscus niagarae</i>	1.65	1.232
<i>Ceratium hirundinella</i>	0.936	1.25

<i>Oocystis sp.</i>	0.209	0.28
<i>Cosmarium sp.</i>	0.079	0.11
Pennate diatoms	0.040	0.05
<i>Oocystis borgei</i>	0.022	0.03
<i>Ankistrodesmus falcatus</i>	0.009	0.01

Total 74.602

Shannon-Weaver [H']	0.80
Species Evenness	0.35
Species Richness	0.36

The phytoplankton community is dominated by the presence of blue-green algal species which is indicative of poorer water quality and eutrophic conditions

### Pollution Assessment

Nonpoint pollution sources are: sedimentation and nutrient loading from grazing and waste materials and litter from recreation. Cattle graze in the watershed and in direct proximity to the reservoir.

There are no point pollution sources in the watershed.

### Beneficial Use Classification

The state beneficial use classifications include:

Information	
Merrill Staley	878-2472
Enterprise Reservoir and Canal Company	878-2331
Five County Association of Governments	
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146
Sherwood Braken	878-2331

boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).

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